

- h) Other activities:** In addition to the primary efforts described in (a) – (f), there are a number of other research areas worth mentioning. This work demonstrates the flexibility and vitality of the group’s program including some collaborative efforts with outside institutions.
- **Exotic Accelerator Physics.** We have explored several exotic accelerator physics applications and continue to actively seek out new opportunities. In this way, we continue to increase our knowledge base in the most exotic and advanced areas of accelerator physics including Photonic Band Gap (PBG) materials and Left-Handed Metamaterials (LHM). During the last year, we have investigated three novel accelerator physics topics: (1) The Multilayer Dielectric-Loaded Accelerator (multilayer DLA); (2) The Reverse Cherenkov Radiator (RCR); and (3) The Left-handed Metamaterial Accelerator (LHM accelerator). The first of these devices is an example of a 1D PBG structure since it prohibits propagation in the radial direction. It is similar to our standard single-layer DLA, but with vastly improved power attenuation. This work resulted in a publication in NIM. We also investigated two ways to make use of the recently discovered LHM. In the first scheme, the RCR, we have designed a cherenkov radiator where cherenkov radiation propagates in the direction opposite to the electron beam. We have simulated this device using Microwave Studio ® and have now begun to make cold test measurements with an HP Network Analyzer. Based on the knowledge and expertise gained with the RCR, we are also beginning to design an accelerating structure based on LHM in collaboration with Prof. G. Shvets of UT at Austin.
  - **Tunable dielectric based wakefield accelerator development.** Working with Dr. Kanareykin and Dr. Schoessow of Euclid Concepts, LLC, we have continued our development of finding a practical method to tune the wakefield excitation frequency of a dielectric structure. In this scheme, the dielectric constant of a ferroelectric material is adjusted by applying an external DC electric field.
  - **Design of a decelerator for CLIC using a thin dielectric layer.** Working with DULY research using Phase II SBIR funding, a new 15.6 GHz decelerator was designed and is under fabrication. It will be used as a dielectric-based power extraction device. This is based on previous experimental results from CLIC Test Facility II. The next experiment is scheduled for next year at the new AWA facility.